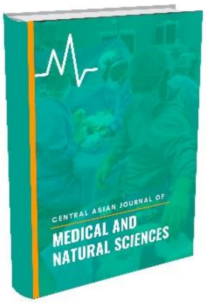
CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES



Volume: 03 Issue: 03 | May-Jun 2022 ISSN: 2660-4159

http:// cajmns.centralasianstudies.org/index.php

AUDITORY ADAPTATION IN PATIENTS WITH PERIPHERAL AND CENTRAL HEARING IMPAIRMENT

Karabaev Hurram Esankulovich[1]
Nasretdinova Maxzuna Taxinovna[2]

EMAIL: luna1088@mail.ru

Received 20th April 2022,
Accepted 18th May 2022,
Online 22nd May 2022

[1]Tashkent Pediatric Medical Institute, Uzbekistan
[2]Samarkand State Medical Institute, Republic of Uzbekistan, Samarkand

ABSTRACT: In 79 normally hearing and in 328 patients with peripheral and central hearing impairment, the reverse adaptation time (VAD) was measured after 2-minute stimulation with a tone of 2000 Hz and 60 dB intensity above the threshold of hearing at the same frequency. It was shown that in patients with peripheral lesions of the sound-receiving apparatus, the value of the VAD did not differ from the norm. It was found that in patients with local brain lesions, the VAD increased sharply with damage to the brain stem and diencephalic structures, as well as in cases where the existing lesion could affect these structures (cerebellopontine angle). This test is proposed to be used in the general complex of otoneurological diagnostics of local brain lesions.

KEYWORDS: sensorineural hearing loss, audiometry, diencephalic structures.

INTRODUCTION

Among the phenomena that characterize the auditory system. a special place is occupied by adaptation to a decrease in auditory sensitivity that occurs as a result of sound exposure [3,5]. In clinical practice, for the differential diagnosis of hearing loss, such parameters of auditory adaptation are used as the value of the shift in the hearing threshold, the recovery time of the threshold sensitivity after sound loading [4,7,8]. Traditional treatment of various forms of sensorineural. Hearing loss does not satisfy clinicians and is effective only in the acute onset of the disease, while the methods of electronic hearing aid with implantation of frequency-modeling stimulators in the cochlea inspire some hope, but their results are still far from ideal [1,4]. All this indicates that treatment in almost all cases is at the later stages of the development of the disease. And this is a consequence of the late diagnosis of the disease, primarily associated with the use of traditional methods for diagnosing hearing impairment, which by now already indicates insufficient methodological support for solving the existing problem and requires the development of fundamentally new approaches to the diagnosis of hearing impairment, which would make it possible to detect the disease on that stages of development when the disorders are still reversible [2,5].

In recent years, there has been an active search for new methods for studying the peripheral and central mechanisms for analyzing sounds in frequency, intensity, duration, binaural interaction, which form the basis of high noise immunity of the auditory system in a wide frequency and dynamic ranges of hearing. In most clinical studies of auditory adaptation, it was noted that the maximum adaptive changes were observed in patients with sensorineural hearing loss of the peripheral type. In contrast to these concepts, in a number of psychoacoustic, psychopharmacological and electrophysiological studies, data were obtained linking adaptation to processes occurring in the central parts of the nervous system [1,5,9]. In recent years, it has been repeatedly suggested that adaptation is related to the state of the central parts of the auditory analyzer [2,5,8,9].

The purpose of this study was undertaken to study the features of auditory adaptation in patients with lesions of various parts of the brain.

MATERIALS AND RESEARCH METHODS

The study was carried out on an AP-5 audiometer from Peterss (England). After registering a tonal audiogram to clarify the level of hearing damage, the patient was subjected to a comprehensive examination, which included the following tests: threshold adaptation, index of intensity increments, duration effect, automatic audiometry, discomfort thresholds.

In some patients, the phenomenon of lateralization was studied by the method of A. Ya. Altman. Then the shift of the hearing threshold and the recovery time of the threshold sensitivity (the time of inverse adaptation to the blood pressure) were determined according to the method adopted in clinical audiometry. The hearing threshold was measured by the 5 dB boundary method, after which the subject was monaurally for 2 min presented with a sound load with a tone of 1000 and 2000 Hz and 60 dB above the hearing threshold. Repeated measurements of the hearing thresholds for a tone of the same frequency were performed immediately after the sound load ceased. the signal was applied for 2-3 seconds at 2 second intervals.

The intensities of the presented signals were changed from lower to higher and after reaching the threshold of hearing in the opposite order.

The magnitude of the shift in the hearing threshold was determined as the difference between the intensity value of the first perceived after the sound load signal and the threshold signal intensity determined before the sound load, where the time elapsed from the moment the sound load was stopped until the initial hearing threshold was restored was taken as the threshold sensitivity recovery time (THR)

The study was conducted on 79 healthy subjects, 152 patients with impaired sound conduction and impaired sound perception of the peripheral type and 97 patients with brain lesions. A total of 328 people, among patients with brain lesions, 14 had a tumor and 83 had focal epilepsy. In addition to neurological, psychiatric, otoneurological and neuro-ophthalmological studies, all patients with brain lesions underwent electroencephalography.

RESEARCH RESULTS

At the beginning of the study, VAD and threshold shifts were determined in healthy individuals and in patients with peripheral hearing impairment; in the future, when analyzing the data, only the results of VAD measurements will be given, since when determining this parameter, the differences between the studied groups of patients were most clearly revealed. It turned out that the average VAD value of healthy individuals was 20.9 e, in patients with sensorineural hearing loss of the peripheral type - 22 s, in patients with otosclerosis - 76.2 s.

A significant increase in VAD was observed in patients with otosclerosis. These changes were noted by K. L. Khilov and N. A. Preobrazhensky and other researchers. It should be emphasized that in sensorineural hearing loss, VAD was short-lived and differed relatively little from the data in healthy people.

Thus, the obtained results show that a pathological increase in VAD is not characteristic of peripheral lesions of the sound-perceiving apparatus; therefore, further studies of auditory adaptation were undertaken on patients with central lesions.

Table 1. VAD in patients with peripheral and central lesions of the auditory analyzer.

Study groups	Recovery time, s	Validity of difference	
		with norm P	with sensorineural hearing loss P
Healthy faces	20,9± 2,4		
Sensorineural hearing loss	22,0± 1,8	>0,05	
Otosclerosis	76,2± 4,5	<0,05	
Tumor of the temporal lobe	21,9 ±1,9	>0,05	>0,05
Frontal lobe tumor	30,3± 1,1	>0,05	>0,05
Parietal lobe tumor	28,4 ±2,3	>0,05	>0,05
Damage to diencephalic structures	83,5± 6,1	<0,05	<0,05
Arachnoiditis of the cerebellopontine angle	73,2± 6,3	<0,05	<0,05
Brainstem lesions	62,3± 22,9	<0,05	<0,05

Table 1 shows the average VAD values in patients with different localization of brain lesions. For comparison, the results of measurements are shown in healthy people, in patients with otosclerosis and in patients with sensorineural hearing loss. Compared with the data in healthy individuals and in patients with sensorineural hearing loss, the most pronounced increase in VAP was observed with lesions of the diencephalic structures, the cerebellopontine angle, and the brainstem.The revealed differences were statistically significant. ($P <0.05$)

For many years, the otorhinolaryngological literature has been dominated by the idea that auditory adaptation is a process directly related to the cochlea [2,8]. The aforementioned authors between the magnitude and the accelerated increase in loudness, characteristic of damage to the hair cells of the spiral organ.

Undoubtedly, the researchers included patients with lesions of both the peripheral and central parts of the auditory analyzer in the group of patients with sensorineural hearing loss, this could not be otherwise, since the level of development of audiology did not allow differential diagnosis of these forms of hearing loss

Over the past decades, studies of domestic and foreign authors have expanded the possibilities of differential diagnosis of various forms of lesions of the sound-receiving apparatus. With the most careful differential diagnostic selection of patients with peripheral lesions of the sound-receiving apparatus, in contrast to the data of some previous researchers, we were unable to find in these patients a significant increase in the value of adaptation. The absence of a distinct increase in time in case of peripheral disturbances of the sound-perceiving apparatus makes one think that the adaptation process develops in the overlying parts of the auditory analyzer. The authors of single studies carried out on patients with brain tumors noted an increase in VAD in most patients, including those with tumors of the posterior cranial fossa. It is quite obvious that the brain stem located in the posterior cranial fossa could not remain intact and in most cases was involved in the pathological process [7, 9].

It can be assumed that with other localizations of brain tumors, as a rule, functional, neurodynamic disorders occurred due to compression, dislocation and hypoxia in the cortex, in the subcortical nodes, in the hypothalamic-pituitary system and other structures of the brain, which in their turn could lead to the emergence of pathological adaptation. Despite the fact that the methods for measuring adaptation were almost identical, in the present study we failed to find an increase in VAP in a number of examined groups of patients with brain lesions.

In particular, with lesions of the temporal, frontal, parietal regions of the brain, the duration of the recovery process remained normal, which, apparently, is associated with the predominance of focal epilepsy among the patients we examined. This circumstance, to a certain extent, limited the localization of the lesion focus. At certain localizations of the lesion focus, VAD in patients with focal epilepsy increased markedly, this was most pronounced in lesions of the diencephalic structures, the cerebellopontine angle and the brain stem.

The fact that an increase in adaptation was observed in brainstem and diencephalic lesions suggests that the regulation of the recovery process after sound stimulation is provided by the brainstem and hypothalamic parts of the central nervous system. As for the increase in VAD in patients with lesions of the cerebellopontine angle, in some cases, such lesions also affect the brain stem.

In favor of the assumption about the connection of adaptation with the brainstem and hypothalamic parts of the brain, the results of psychopharmacological experiments have shown that the value of auditory adaptation is determined by the state of the nonspecific system of the reticular formation of the brain stem and the posterior hypothalamus.

FINDINGS

Adaptation decreases markedly when taking drugs that suppress the activity of these structures and increases with the action of drugs that enhance the activity of the reticular formation and the hypothalamus. Thus, the auditory adaptation caused by moderate levels of sound stimulation can serve as an indicator characterizing the state of some central parts of the brain. All of the above suggests that the use of adaptation tests for diagnosing lesions of the hearing organ and for professional selection requires significant correction.

REFERENCES:

[1]. Вельтищев Д.Ю. Психопатологические аспекты головокружения. // Журнал неврологии и психиатрии им. С.С. Корсакова. —2010. —Т. 110, №5 - С. 69-72.

[2]. Зайцева О.В. Обследование и реабилитация больных с периферическим вестибулярным головокружением. // Вестник оториноларингологии. —2010.—№ 6. —С. 44-47.

[3]. Левин О.С. Сенсоневральная тугоухость: от патогенеза к лечению // Трудный пациент. —2010. —Т. 8, №4. —С. 8-15.

[4]. Садоха К.А. Мигрень и головокружение // Неврология и нейрохирургия Восточная Европа. -—2013. —№ 1. —С. 71-79.

[5]. Толмачева В.А., Парфенов В.А. Причины головокружения у пациентов с артериальной гипертензией и его лечение // Врач. — 2007. - № 4. - С. 49-53.

[6]. Arbusow V., Schulz P., Strupp M. et al. Distribution of herpes simplex virus type 1 in human geniculate and vestibular ganglia: implications for vestibular neuritis // Ann Neurol. —2015. —Vol.46. — P.16-19

[7]. Babin RW, Harker LA, The vestibular system in the elderly // Otolaryngol Clin North Am. —2012. –Vol. 15, №2. —P.387—393

[8]. Bisdorff A, Von Brevern M, Lempert T, Newman-Toker DE. Classification of vestibular symptoms: towards an international classification of vestibular disorders // J Vestib Res. —2009. –Vol. 19, №l-2. —P. 1-13

[9]. Nasretdinova M. T., Karabaev H. E., Sharafova I. A. Application of methodologies of diagnostics for patients with dizziness //CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES. – 2020. – T. 1. – №. 1. – C. 29-33.

[10]. Nasretdinova M. T., Karabaev H. E. Vestibular neuronitis-the problem of systemic dizziness //European science review. – 2019. – T. 2. – №. 1-2.Singh R.K., Singh M. Oтorhinolaryngology Clibics: An International Journal. 2012. Vol. 4(2). P. 81–85.